An overview of spiny lobster management strategies

Lessons learned from around the world

Sarah Valencia
Shoreline Resource Consultants, LLC
Sept 5, 2012

A Generic Management Framework

Data — Sampling protocol used to monitor the health of the stock

Assessment — The model used to determine the current status of the stock

Control Rule/ Reference Points — An algorithm that specifies how regulations change when certain criteria (reference points) are met

Regulations—Management actions utilized to meet management goals

West Coast Groundfish

PFMC's management framework for west coast groundfish stocks

- data collection
- a stock assessment
- a reference-point based harvest control rule to set the target catch
- fishery regulations to achieve target catch

Hilborn 2002

West Coast Groundfish: Data Collection

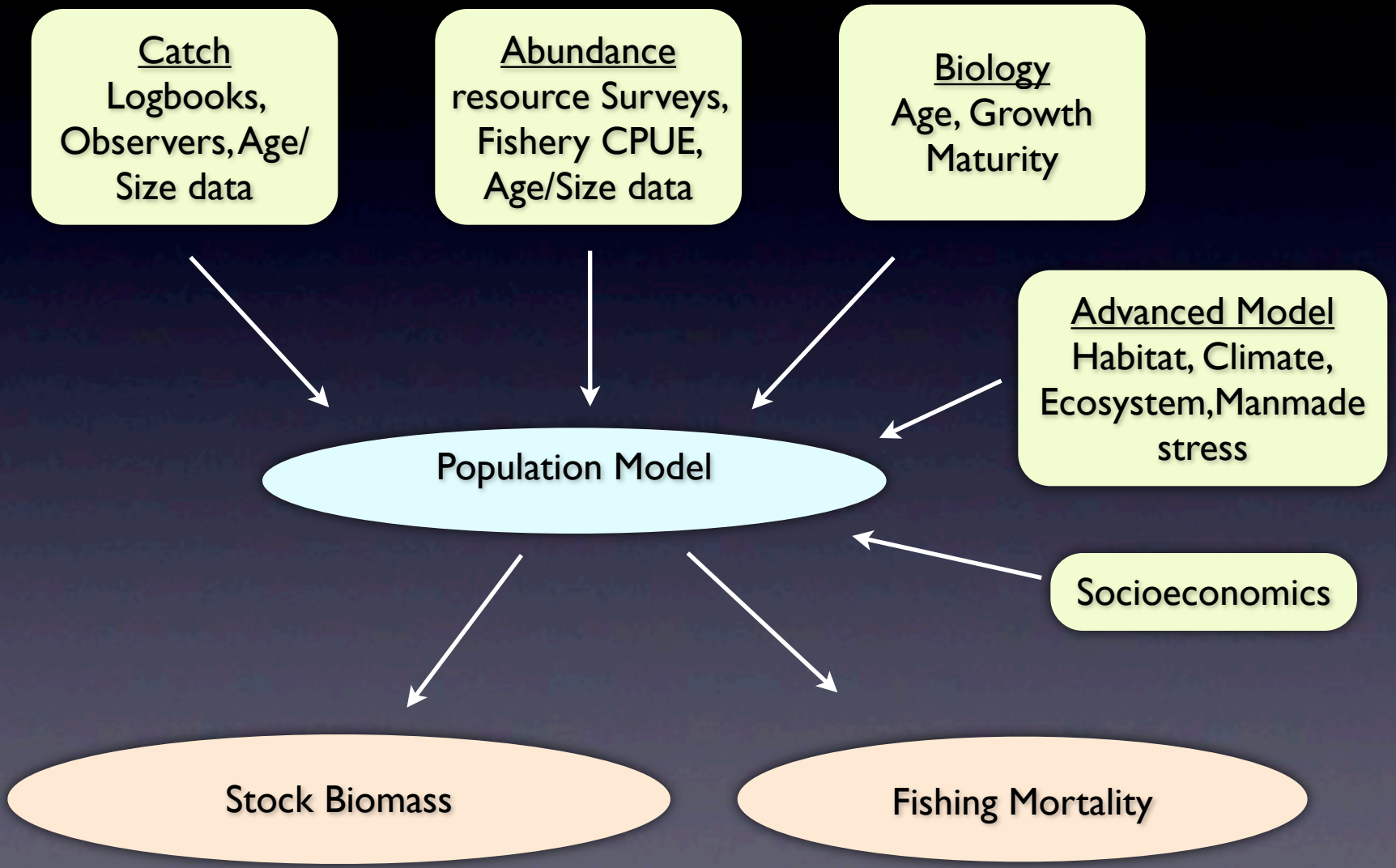
Fishery-dependent data:

- time/ location of fishing activities
- total catch and catch composition
- effort
- biological sampling: age, growth, maturity

Fishery-independent data:

- surveys provide an index of abundance
- mark-recapture

West Coast Groundfish: Stock Assessment



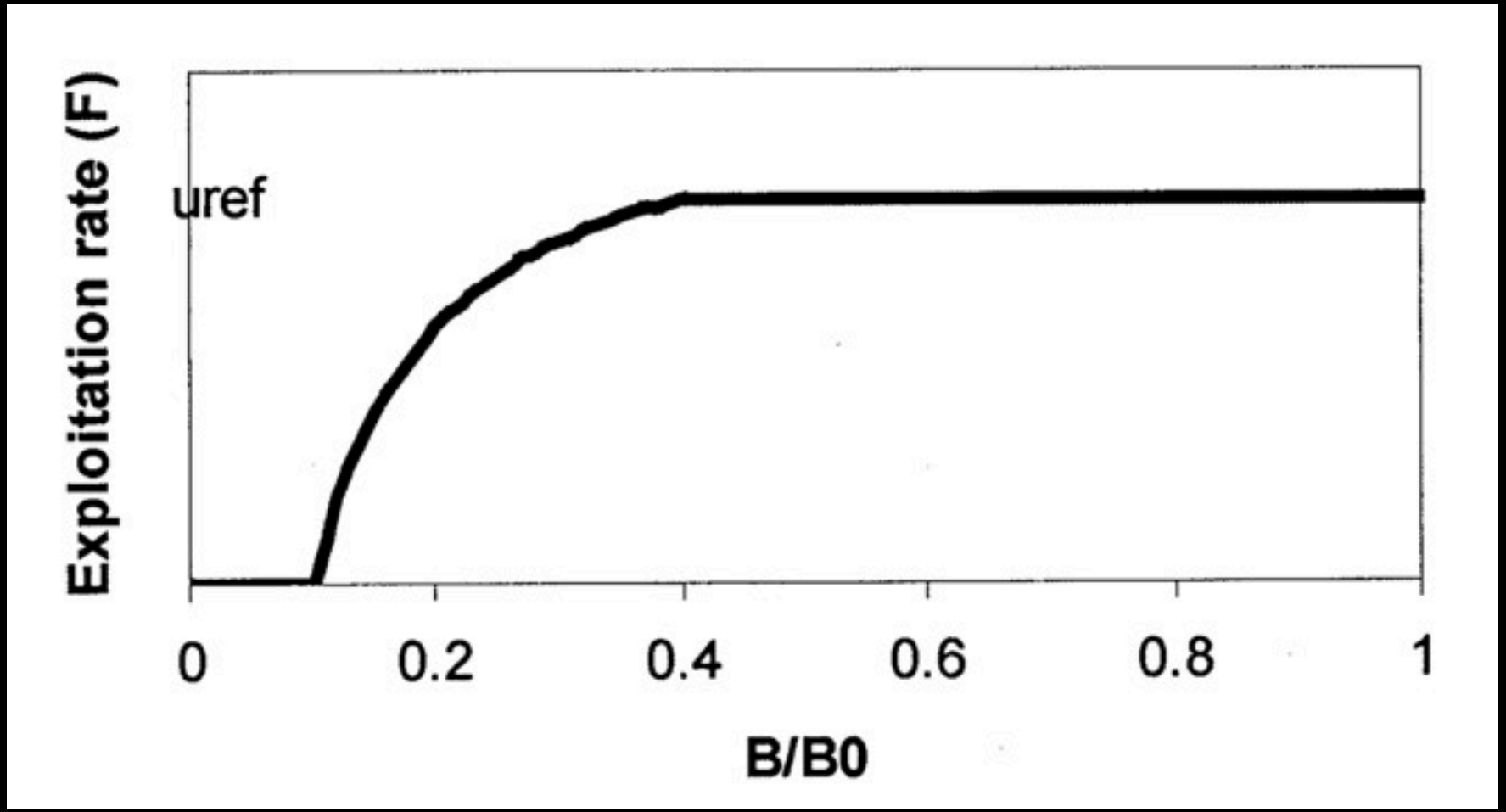
Adapted from NOAA website

West Coast Groundfish: Reference Point based control rule

2 types of reference points:

- Biomass-based RPs: B0, Bopt, Bcrash. Tells you if stock is currently overfished.
- Fishing mortality-based RPs: Fcurr, Fopt. Tells you if overfishing is currently occuring.

West Coast Groundfish: 40/10 rule



Hilborn 2002

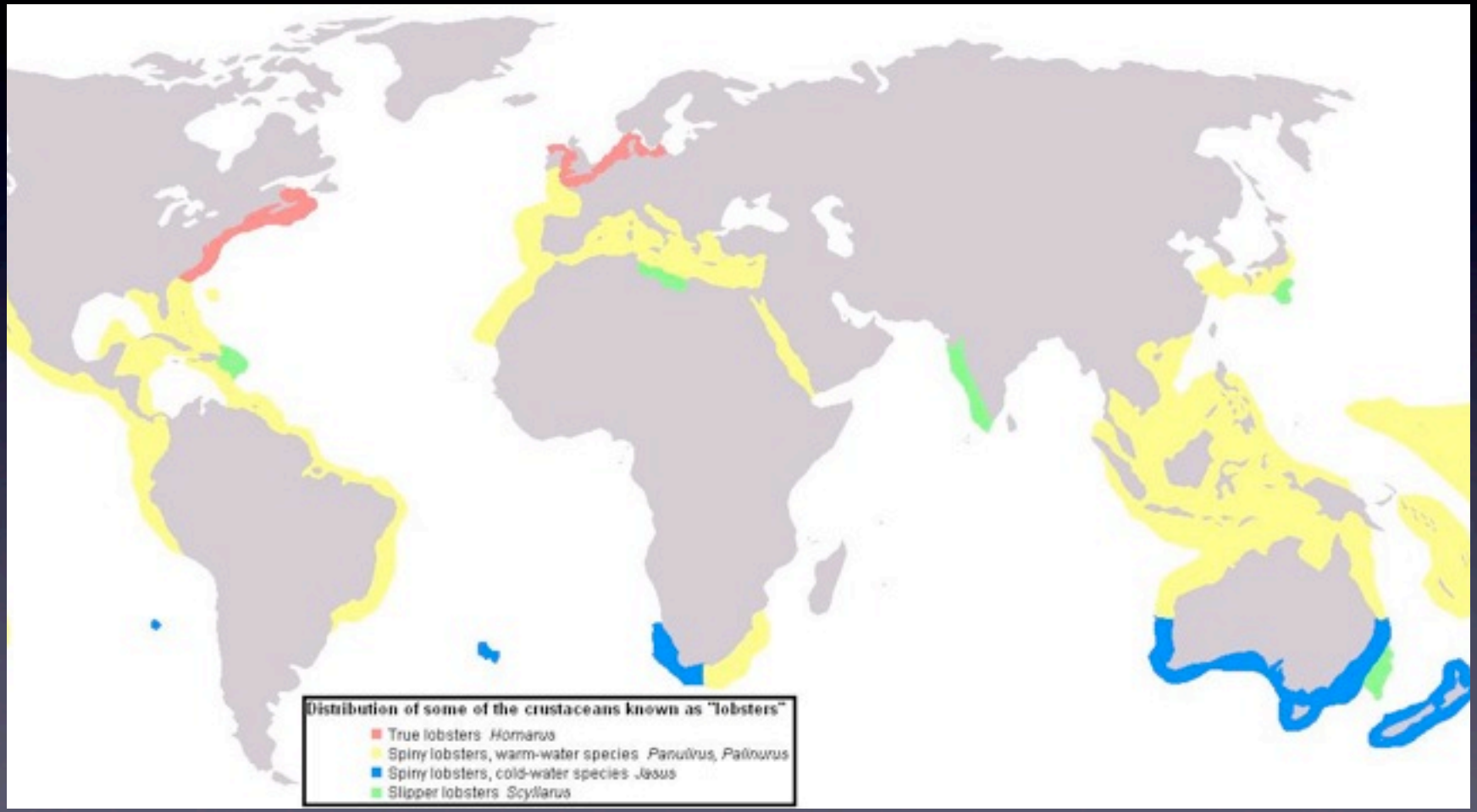
West Coast Groundfish: Controls

3 types of regulations/ controls:

- biological: protect spawning biomass
- effort-based: limit fishing effort
- catch-based: limit total catch

Most fisheries managed using a combination of a) biological and b) catch or effort controls

Worldwide Lobster Distribution



Case Studies

Western Australia (*P. cygnus*)

New Zealand (*J. edwarsii*)

South Australia (*J. edwarsii*)

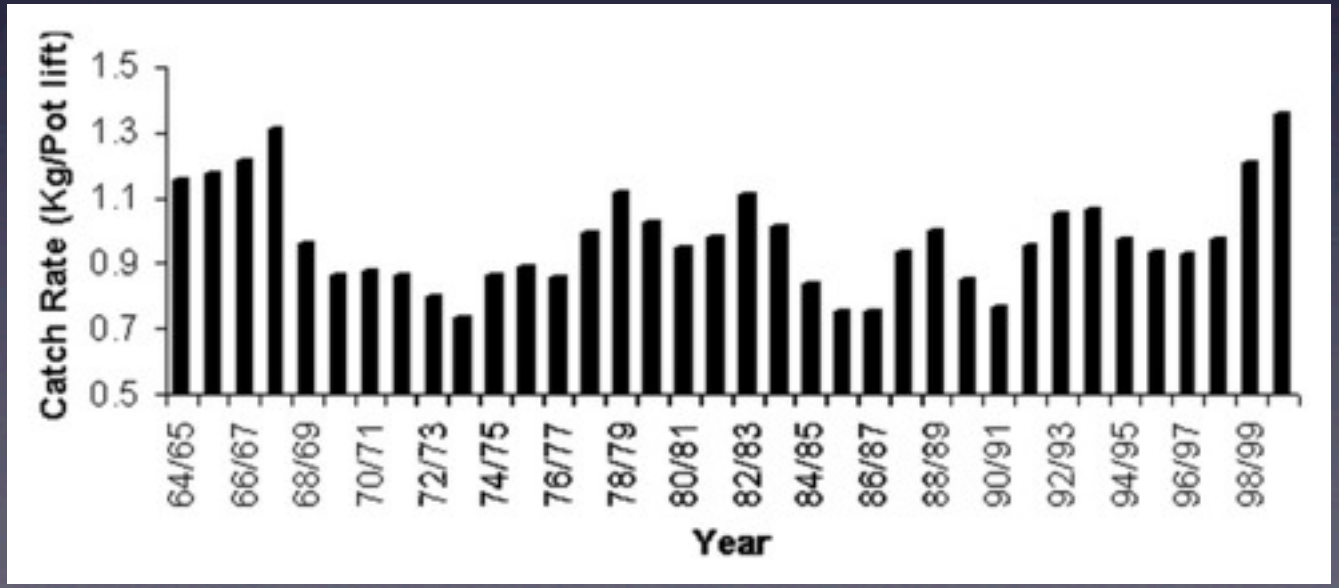
Caribbean (*P. argus*)

Baja California, Mexico (*P. interruptus*)

Maine (*Homarus americanus*)

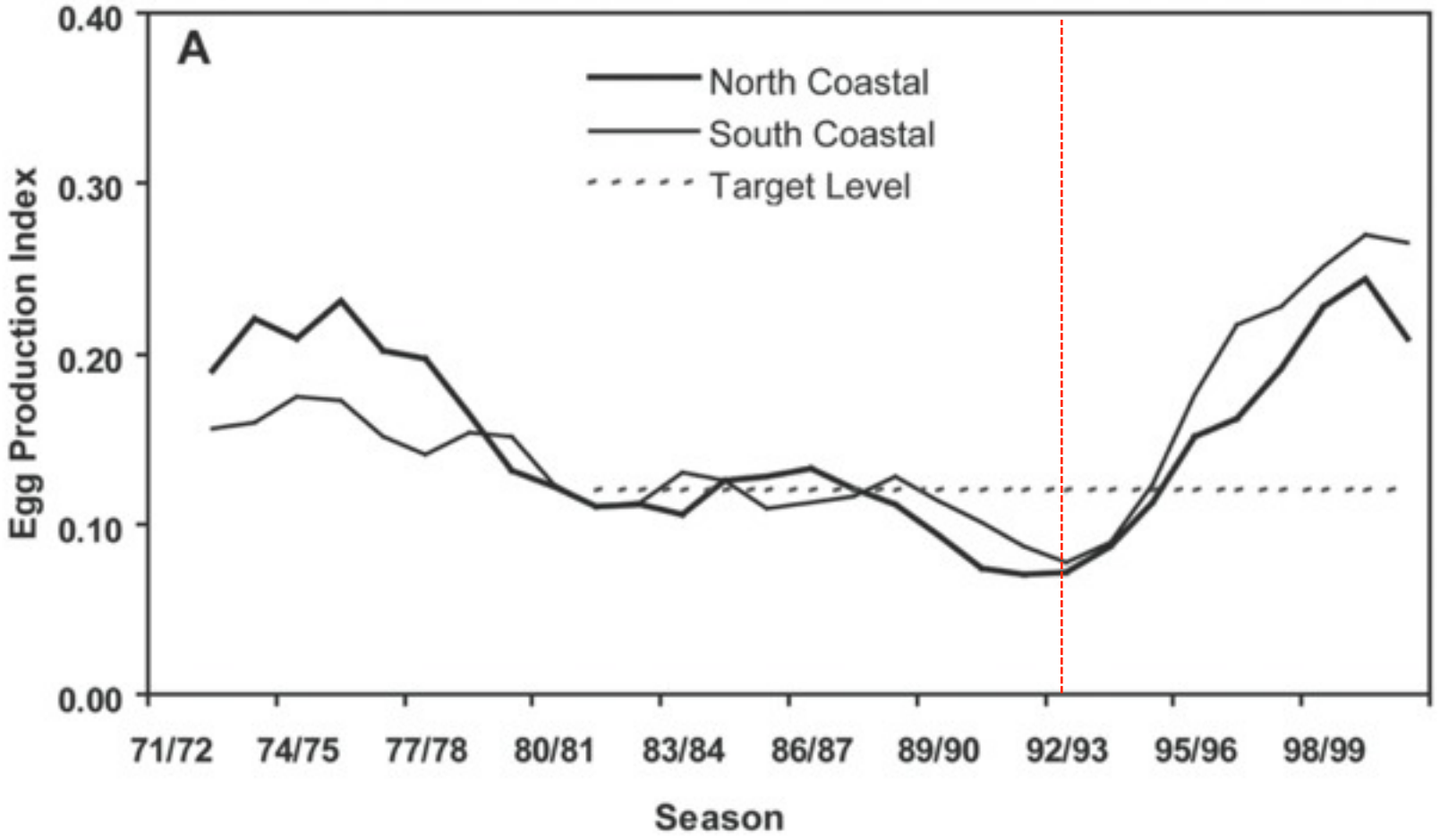
Fetherston 2005

- Largest spiny lobster fishery: 11,000 tons
- 95% commercial, 5% recreational
- Limited entry fishery in 1963
- Effort controlled–Global, zonal, and individual trap limits



FAO 2003

Western Australia



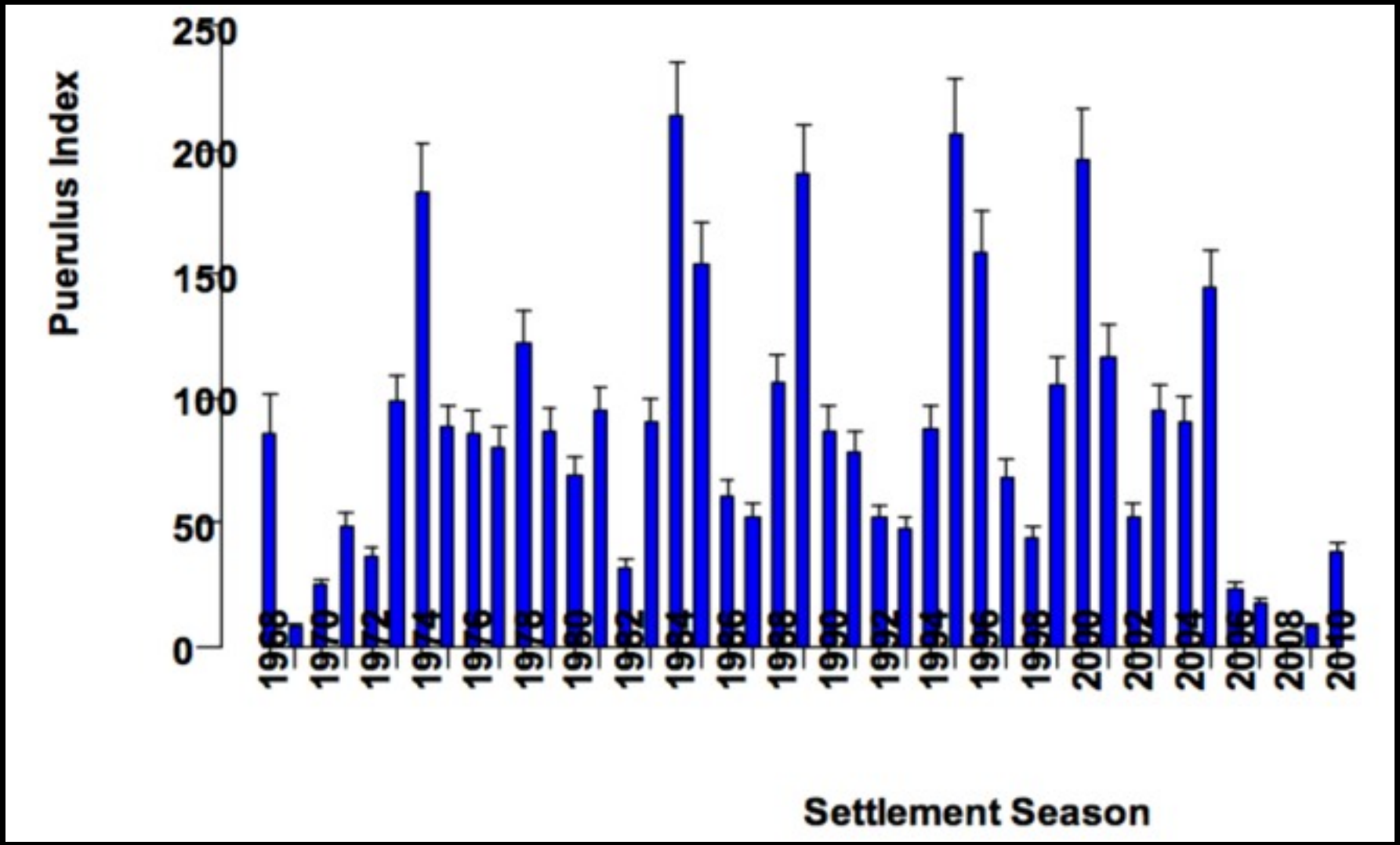
Data — catch, effort, length frequencies, FI survey, puerulus settlement

Assessment — modeled projections of 1) Egg production index, 2) Effort producing MEY

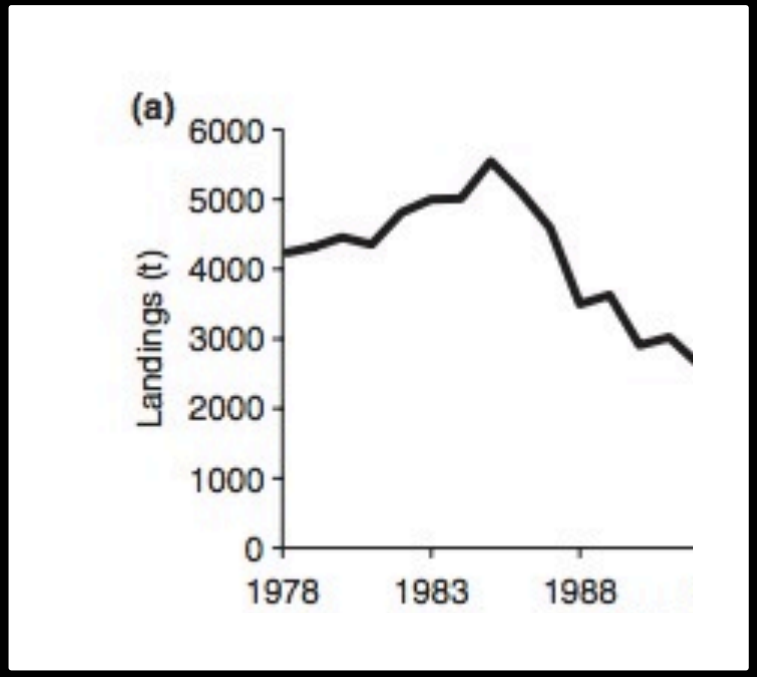
Control Rule/ Reference Points — 1 biological (20% SPR) and 1 economic (F_{MEY}) RP, no defined control rule

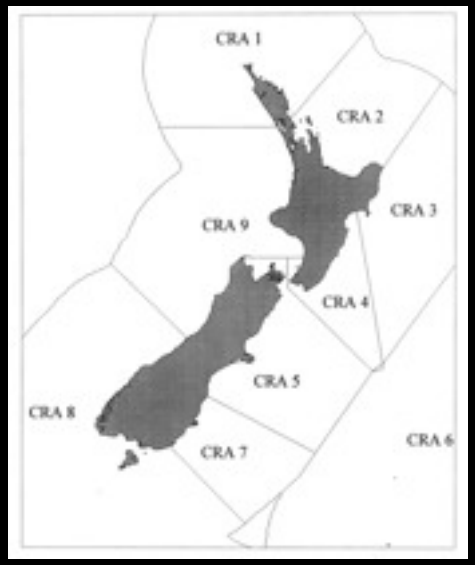
Regulations — Total allowable effort, MSL, no take of breeding females

Western Australia



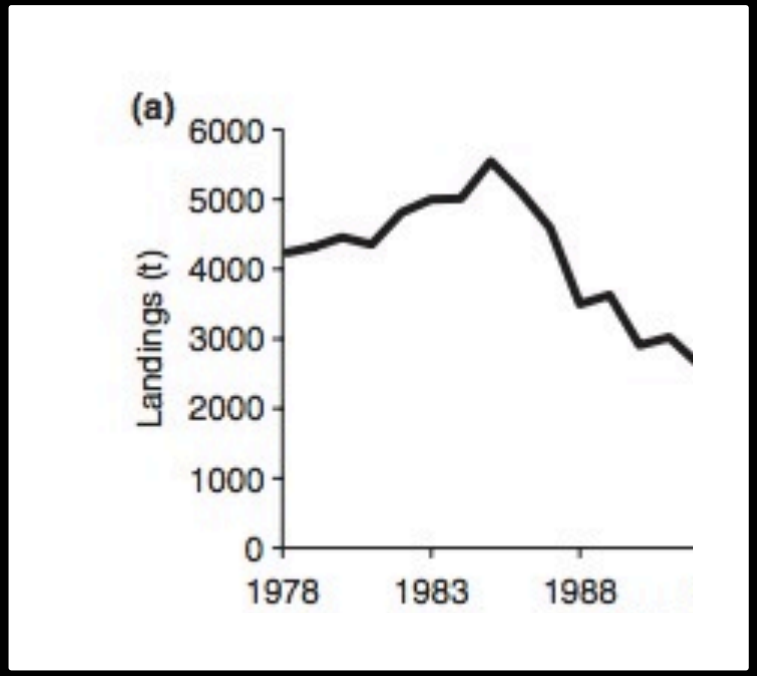
- 3,000 tons per year
- 10% recreational, 10% customary
- Effort managed fishery until 1990
- Integrated into NZ's ITQ program
- 9 management units





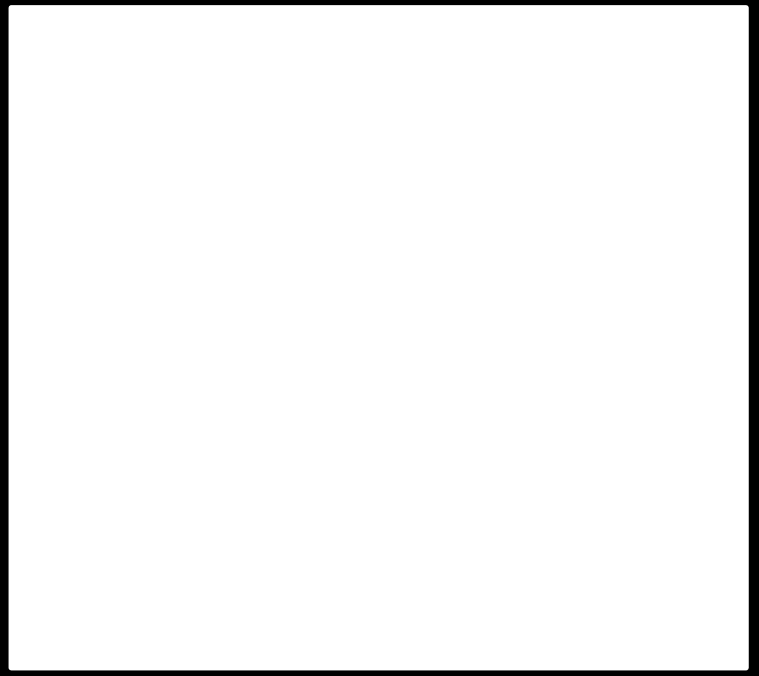
Miller and Breen 2010

New Zealand



Miller and Breen 2010

New Zealand



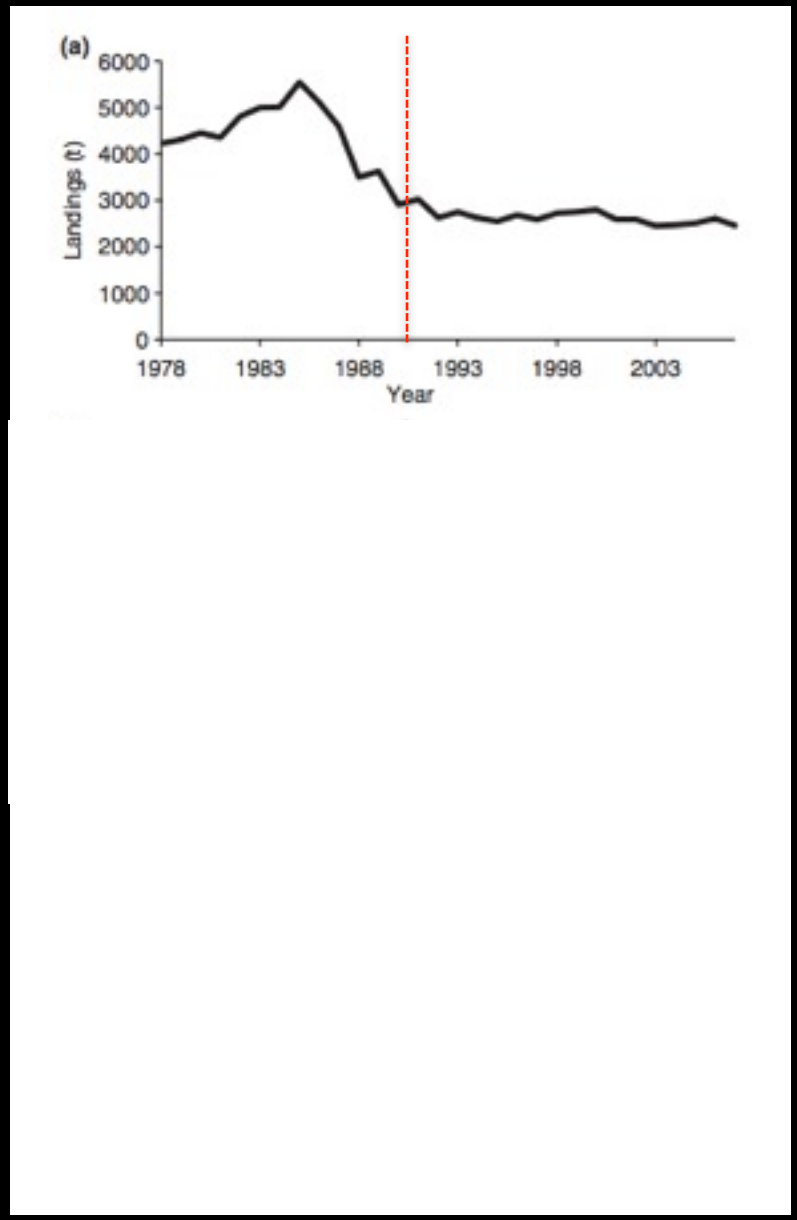
Miller and Breen 2010

Data — catch, effort, length frequencies, tag-recapture, puerulus settlement

Assessment — length and sex based Bayesian model to estimate biomass

Control Rule/ Reference Points —evaluate ability to reach B_{MSY} in next 3 years

Regulations — TAC set each year. MSL based on tail width, no take of egg-bearing females

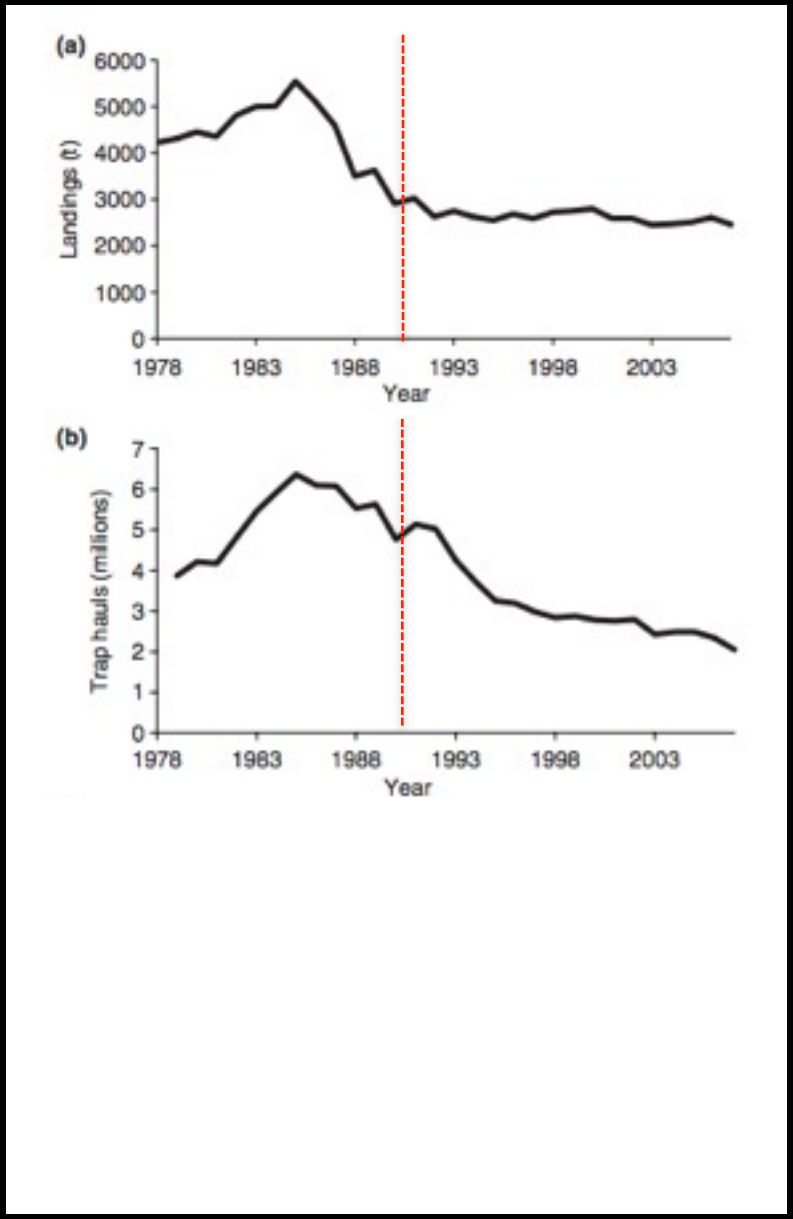


Data — catch, effort, length frequencies, tag-recapture, puerulus settlement

Assessment — length and sex based Bayesian model to estimate biomass

Control Rule/ Reference Points —evaluate ability to reach B_{MSY} in next 3 years

Regulations — TAC set each year. MSL based on tail width, no take of egg-bearing females

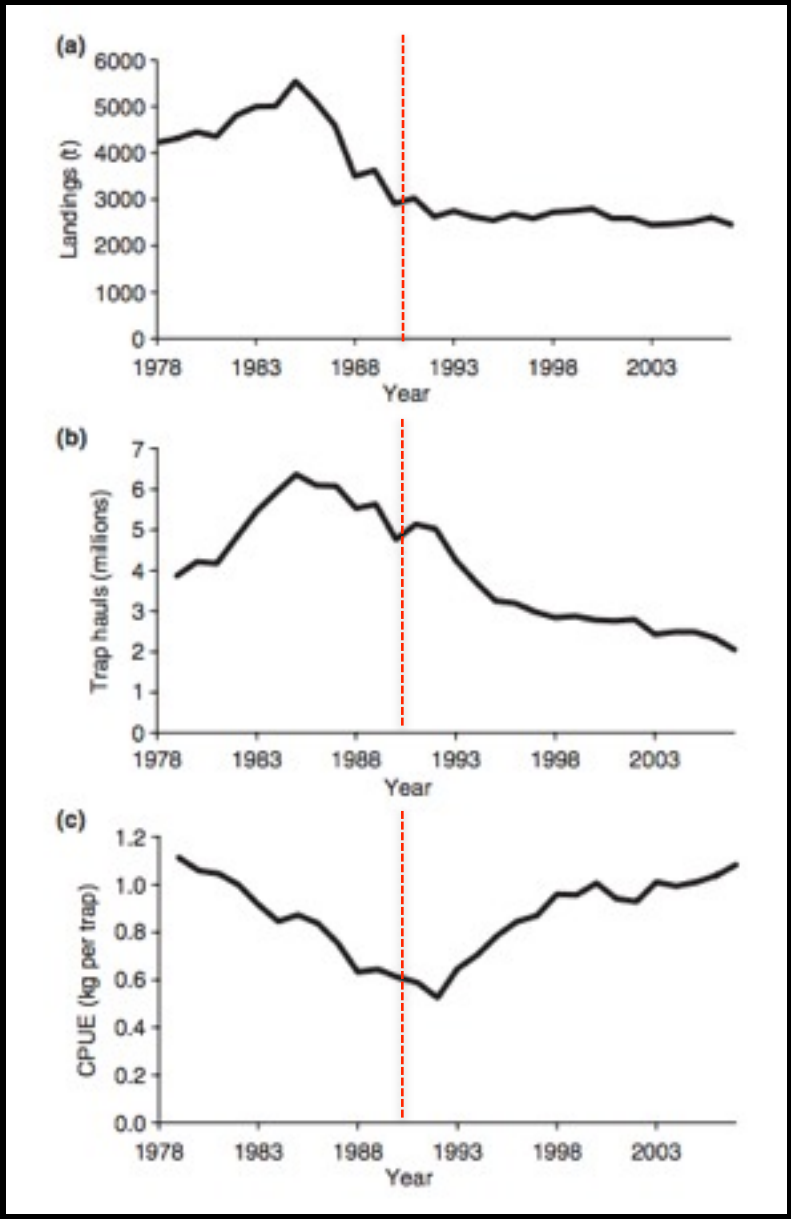


Data — catch, effort, length frequencies, tag-recapture, puerulus settlement

Assessment — length and sex based Bayesian model to estimate biomass

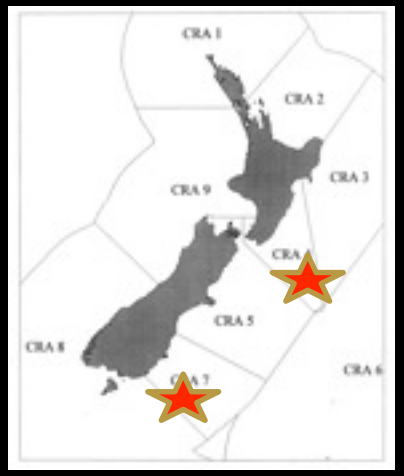
Control Rule/ Reference Points —evaluate ability to reach B_{MSY} in next 3 years

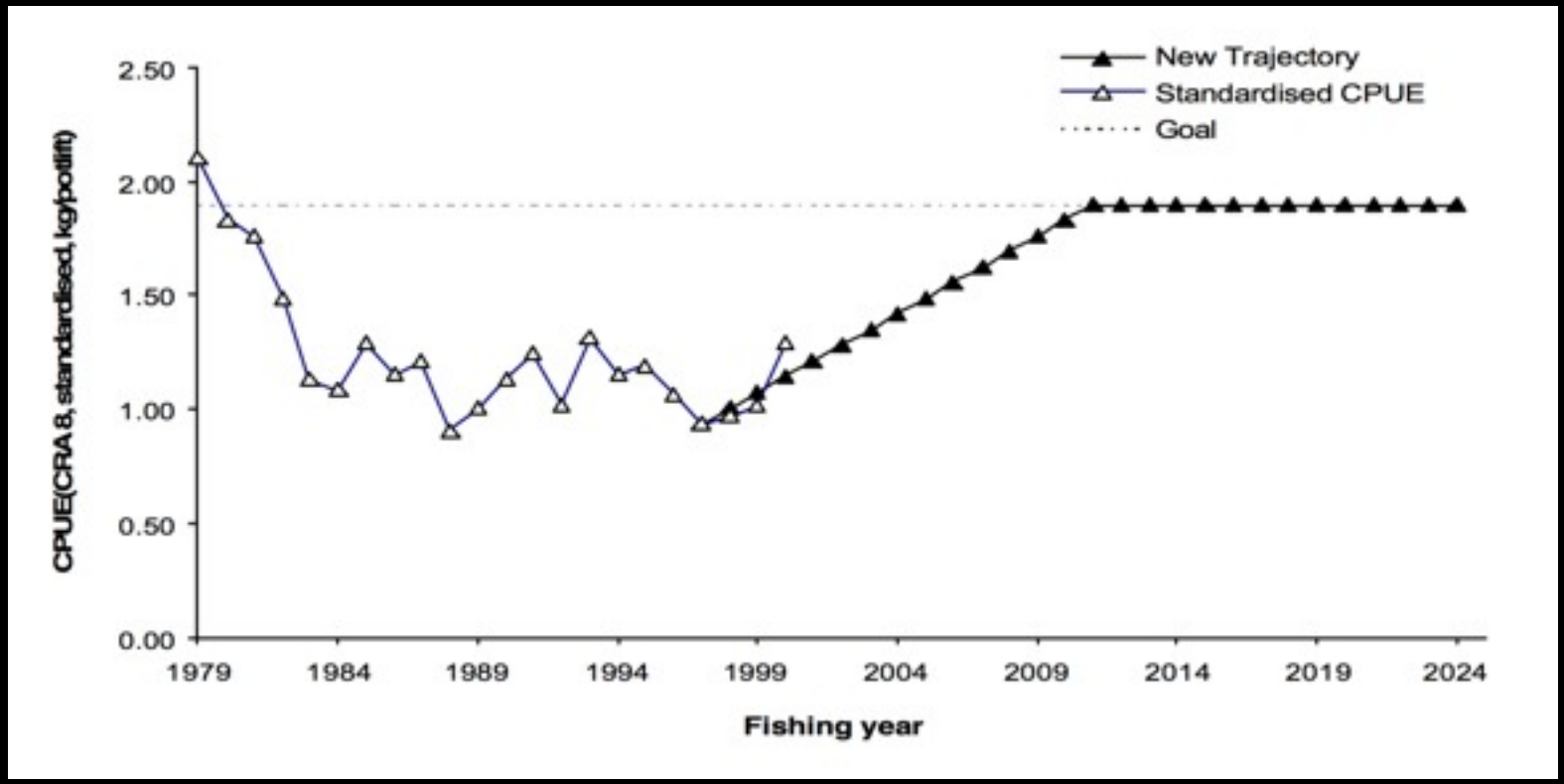
Regulations — TAC set each year. MSL based on tail width, no take of egg-bearing females



New Zealand

Benefits of adaptive management

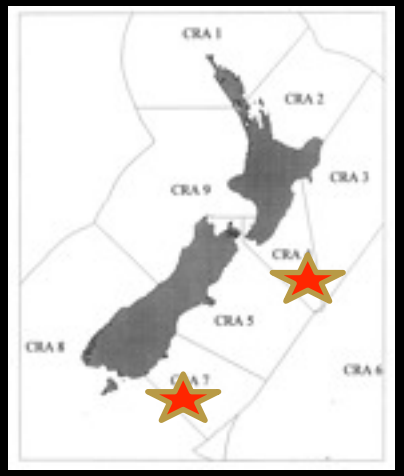




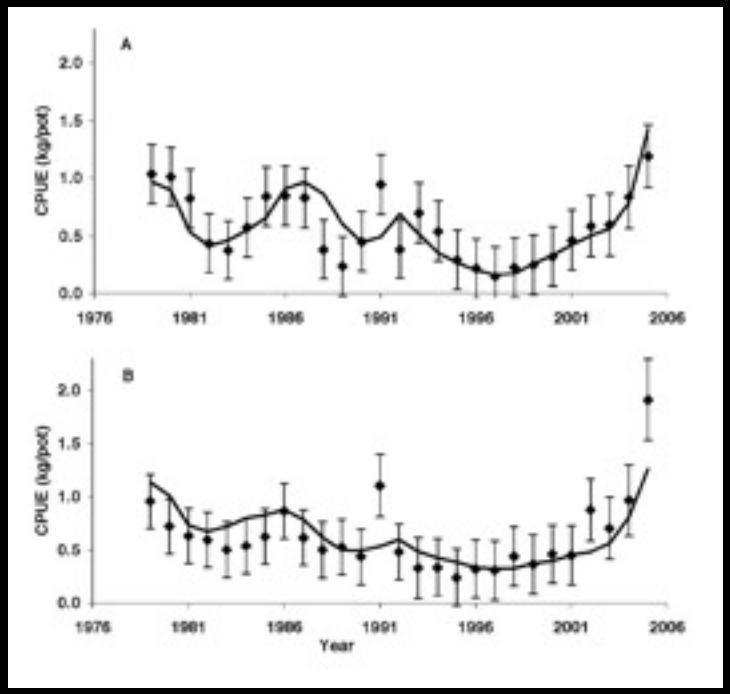
Bentley et al. 2003

New Zealand

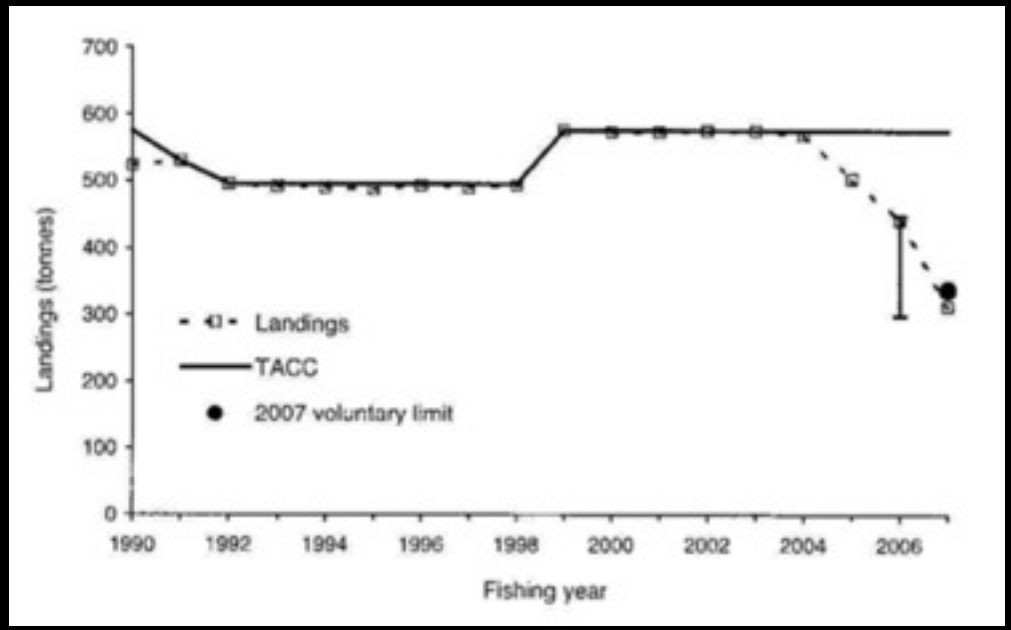
Benefits of adaptive management



Area 7 and 8 Performance



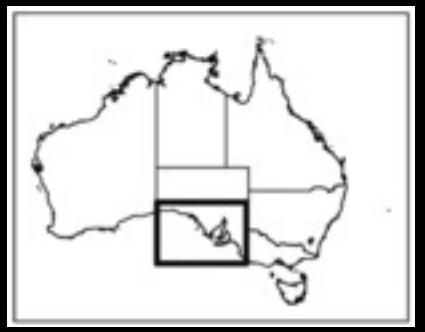
Area 4 Performance

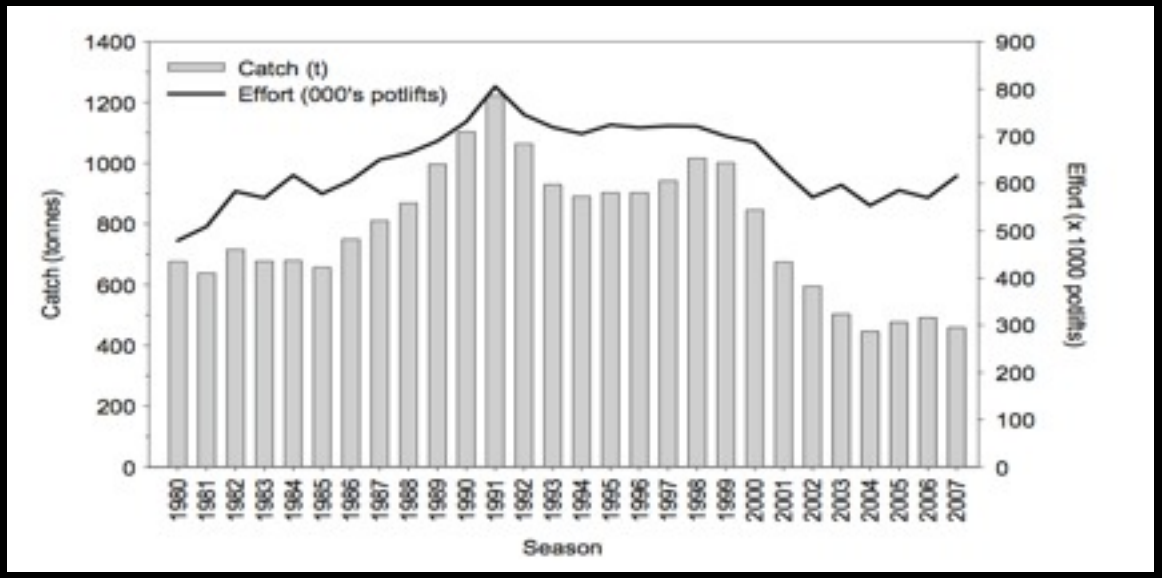


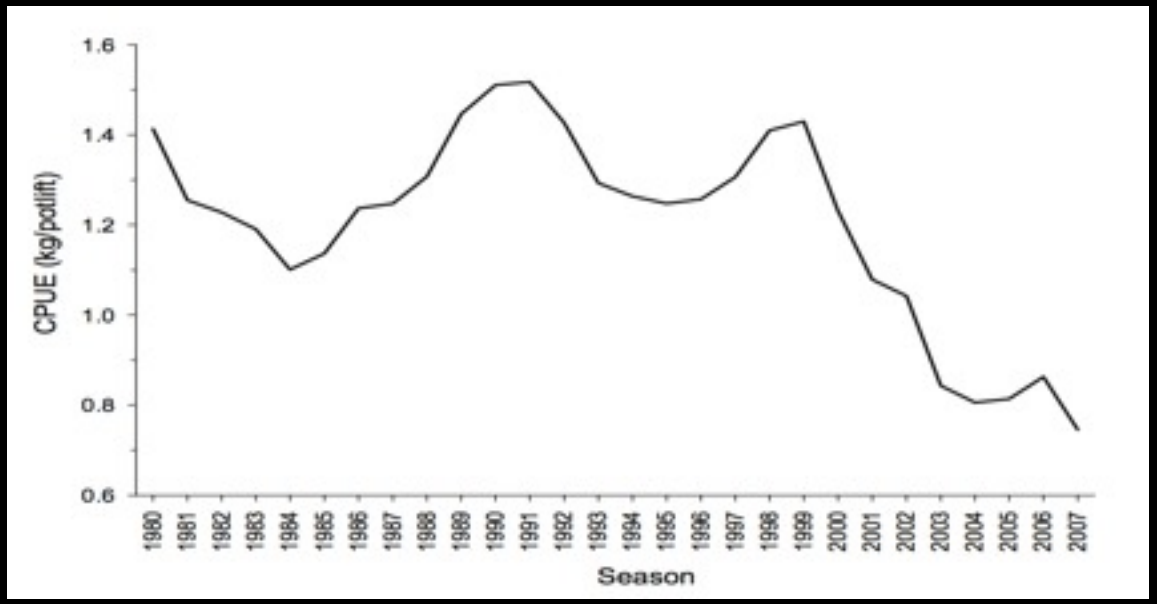
Haist et al 2010

Breen et al. 2010

South Australia

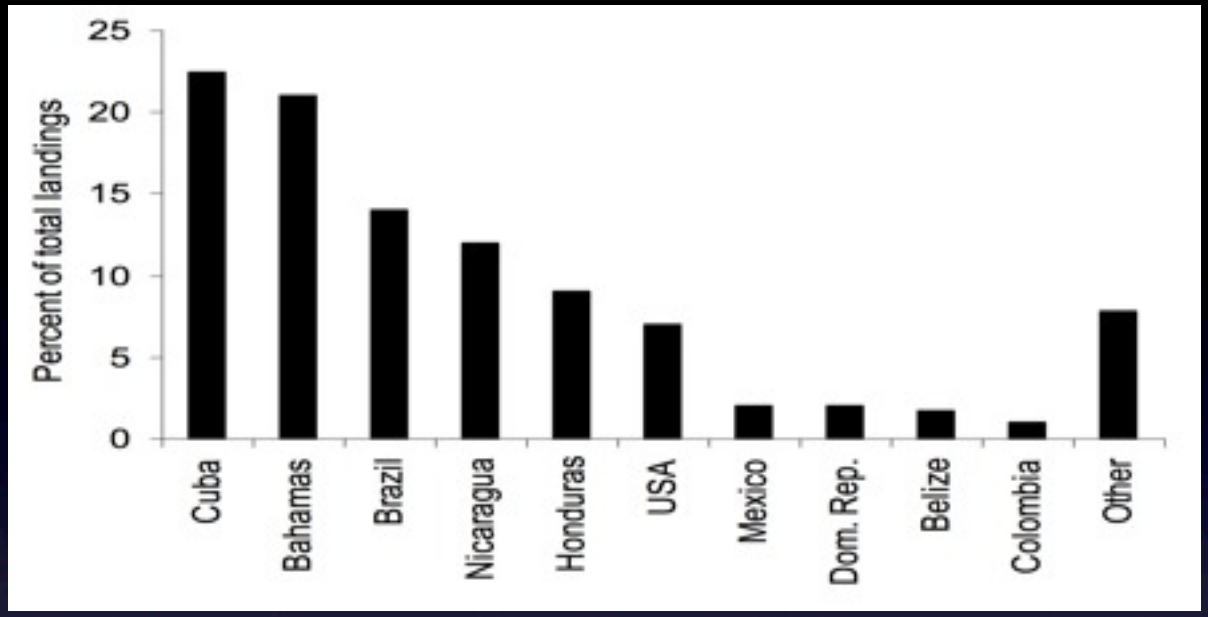


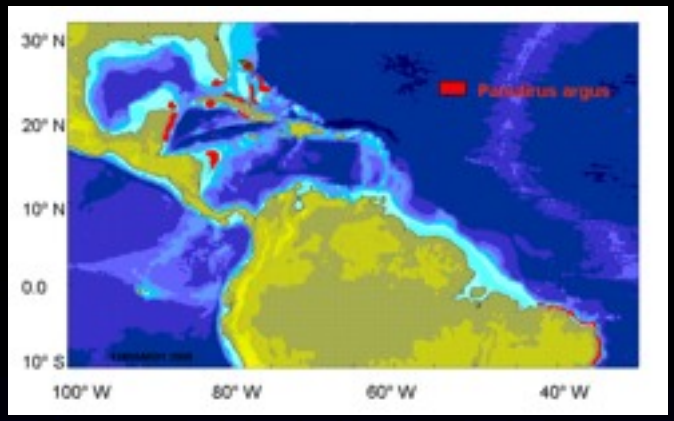


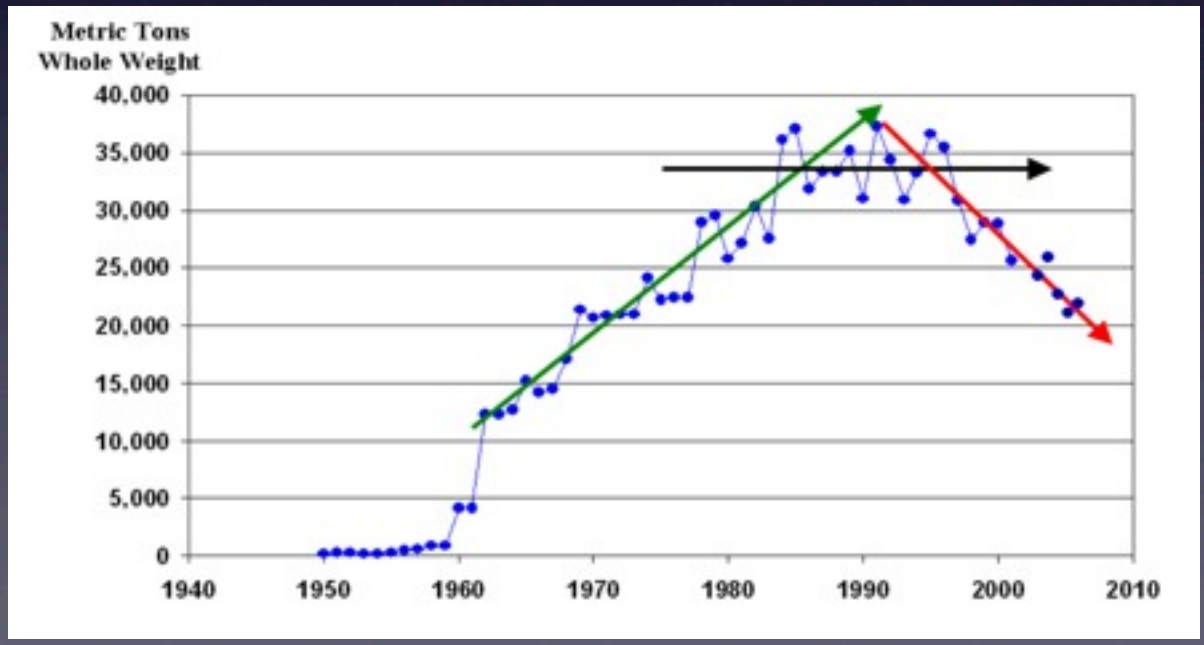


Linnane et al 2010

Caribbean



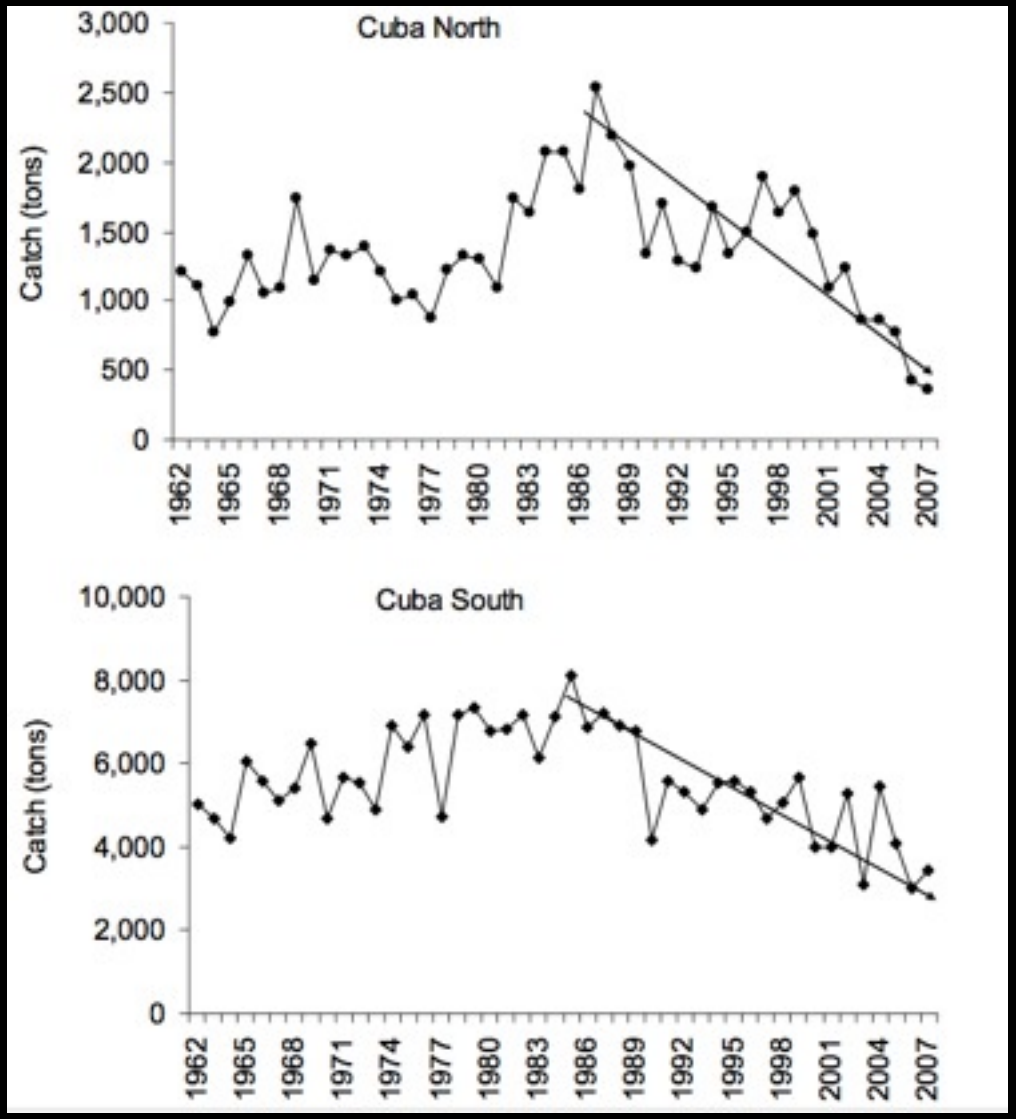




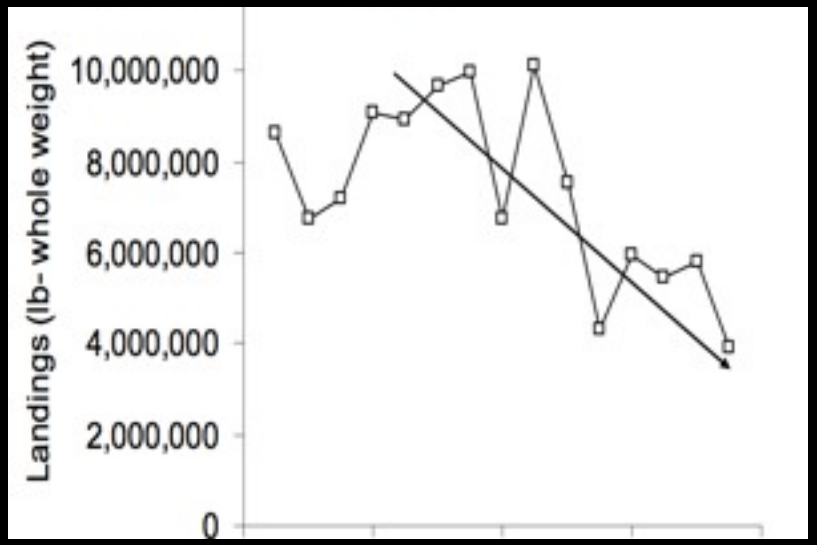
Ehrhardt et al. 2011

Cuba	Florida
Data — catch, effort, size of monthly landings	**Data** — catch, effort
Assessment — Sequential population analysis to estimate F	**Assessment** —Surplus Production Model
CR/ RPs — $F_{14.3\%}$ (replacement SPR)	**CR/ RP** — OFL at $F_{20\%}$ SPR, MSY
Regulations — limited entry, TURFs, gear restrictions, closed seasons/ areas, MLS, no-take of egg-bearing females	**Regulations** — gear restrictions, closed seasons, MLS, no-take of egg-bearing females

Cuba



Florida



Ehrhardt et al. 2011

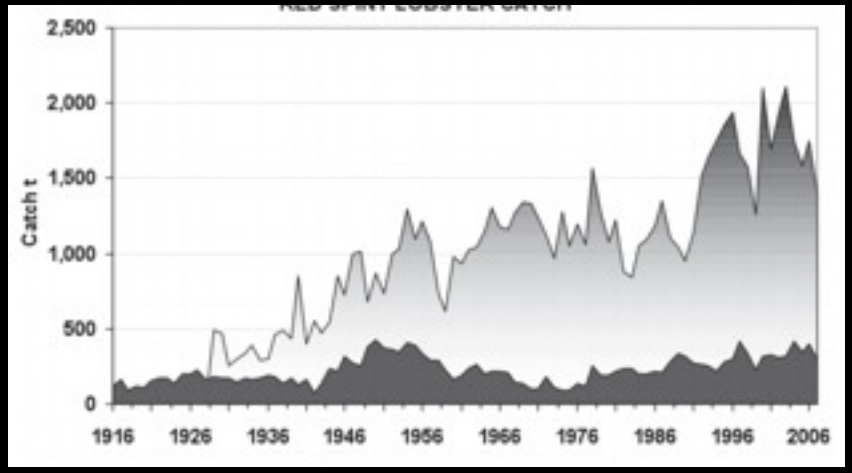
Baja, Mexico

Data—catch, effort, size and sex distribution monthly. Monitor reproductive stage during closed season

Assessment—Biomass dynamic, Leslie-Delury, length based VPA, Thompson and Bell, bioeconomic

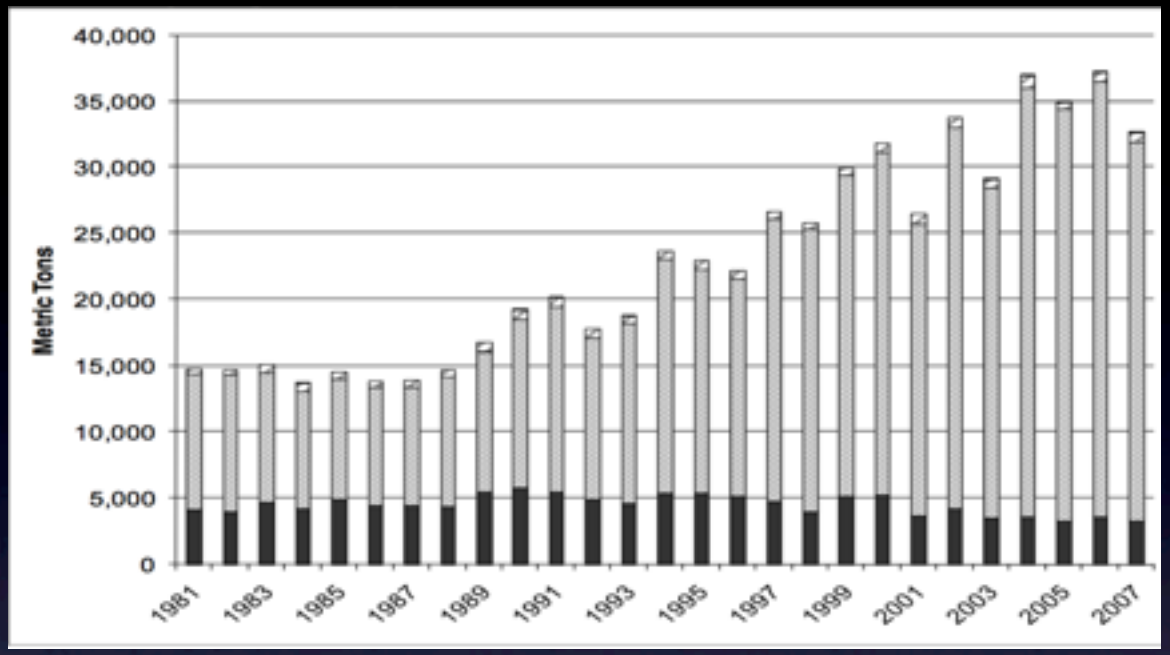
Control Rule/ Reference Points—
using B/Bmsy since 2000. Effort regulated within cooperatives

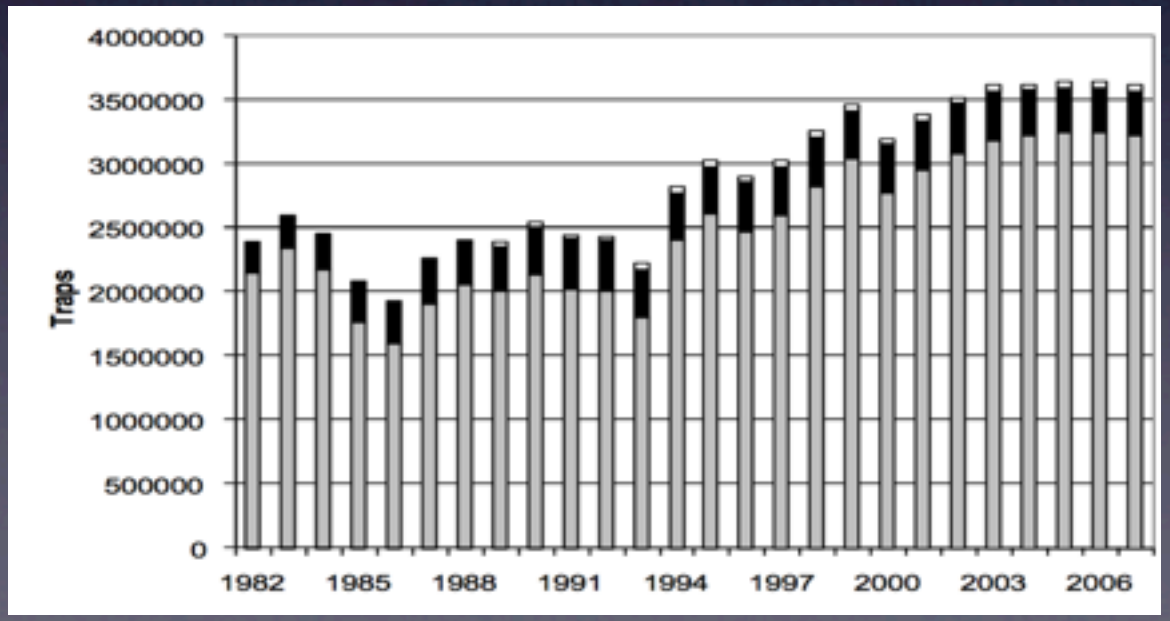
Regulations— TURFS, closed season, MLS, no take of egg-bearing females



Chavez and Gorostieta 2010

Gulf of Maine





- 76 percent of US landings
- <5% recreational catch

Data — catch, effort, length frequencies, FI trawl survey, settlement, ventless traps

Assessment —Statistical Catch-at-length model

Control Rule/ Reference Points — Abundance and Fishing Mortality thresholds

Regulations — Total allowable effort, slot limit, no take of breeding females

Conclusions

CPUE is highly informative

Size structure can provide an SPR-based reference point

Need for redundancy in controls-Combining Bbiological controls with catch or effort

Control rules that adjust effort/ catch in relation to targets can prevent drastic management actions later

Thank You

Questions?